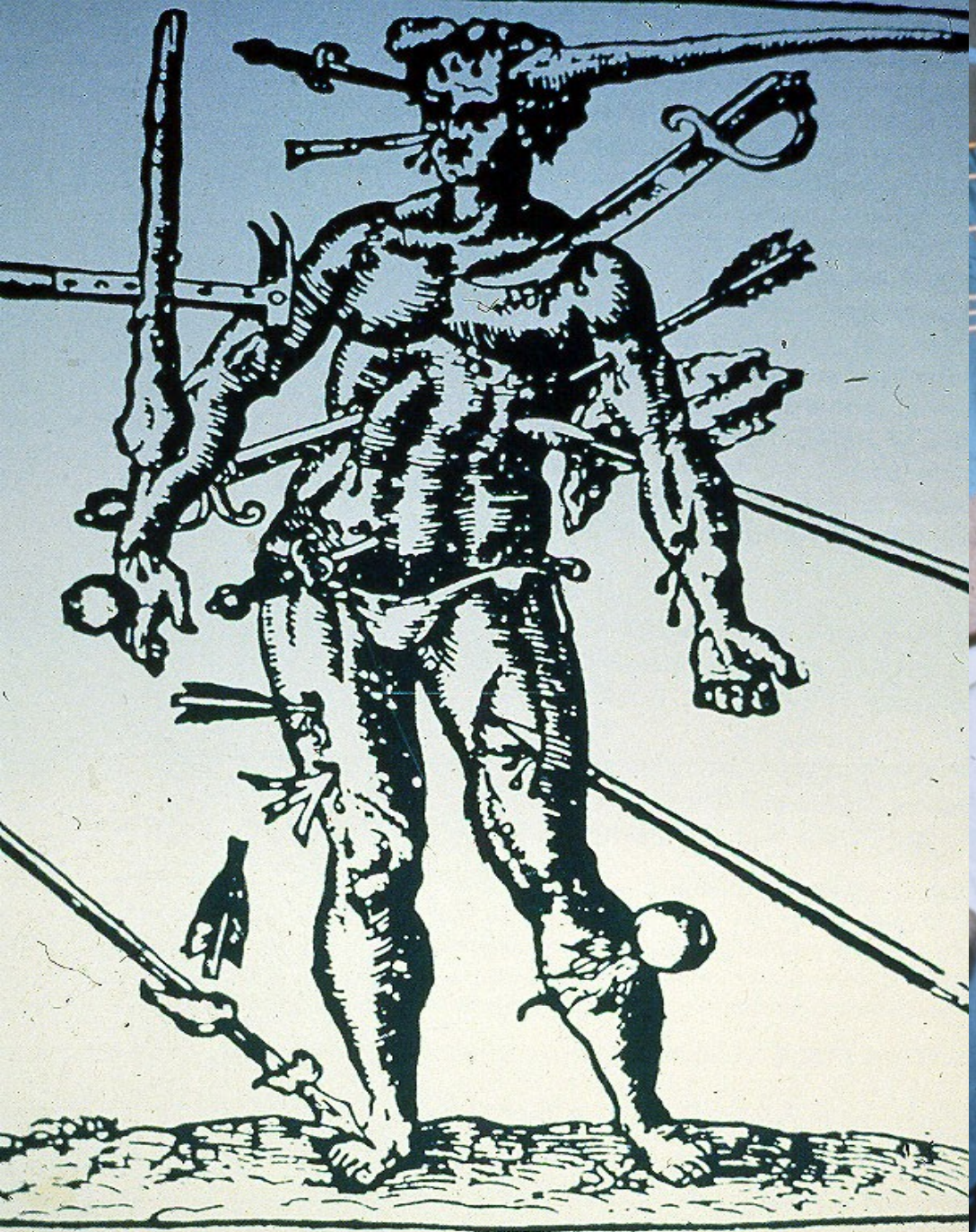
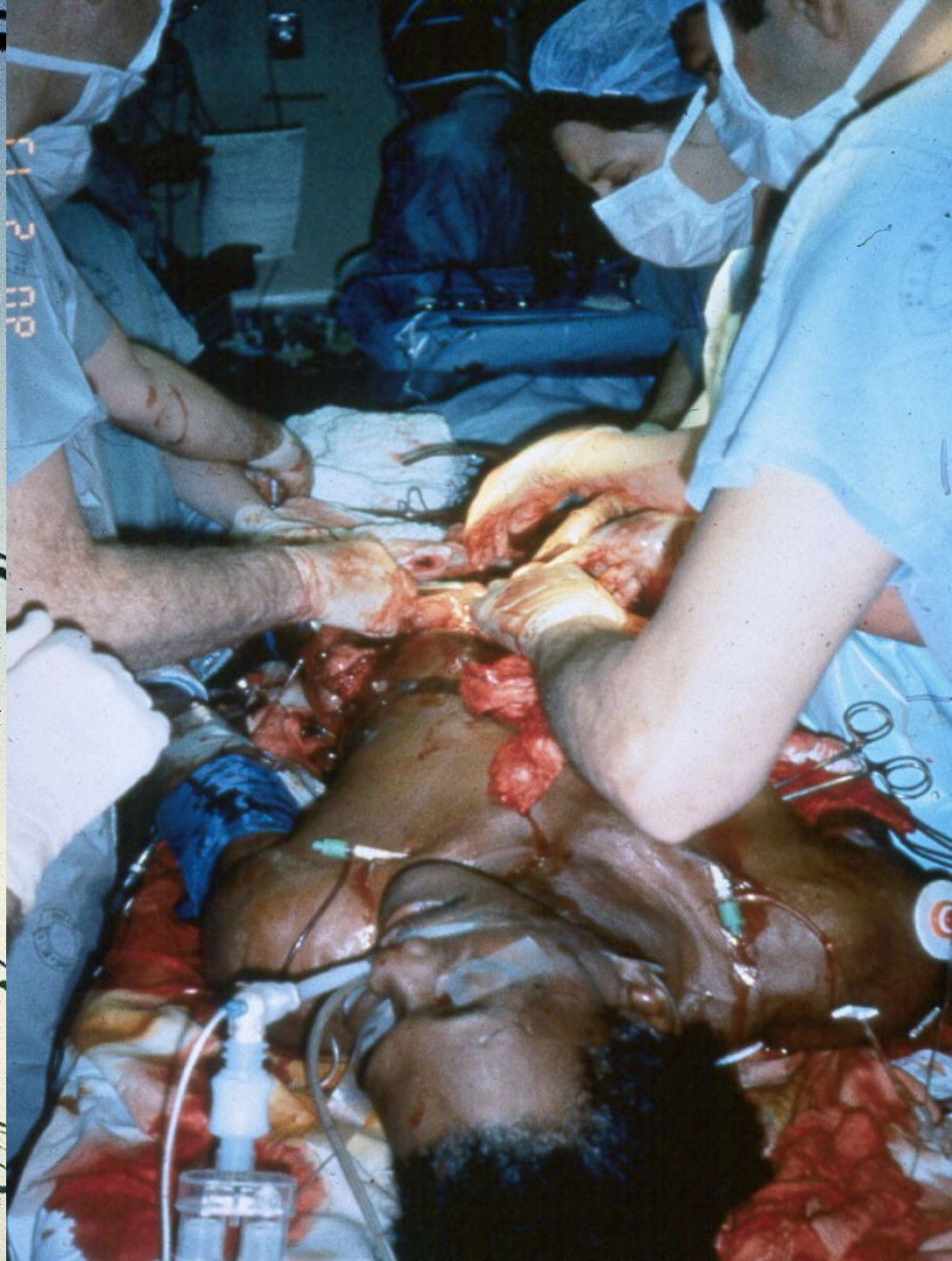
Fleet Surgical Team 9 General Surgeon

Peter Rhee MD, MPH,
FACS, DMCC,
Associate Professor



the wounded man



Why we exist

- Mercy / Comfort
- Fleet hospitals
- other operational requirements

Military Medicine

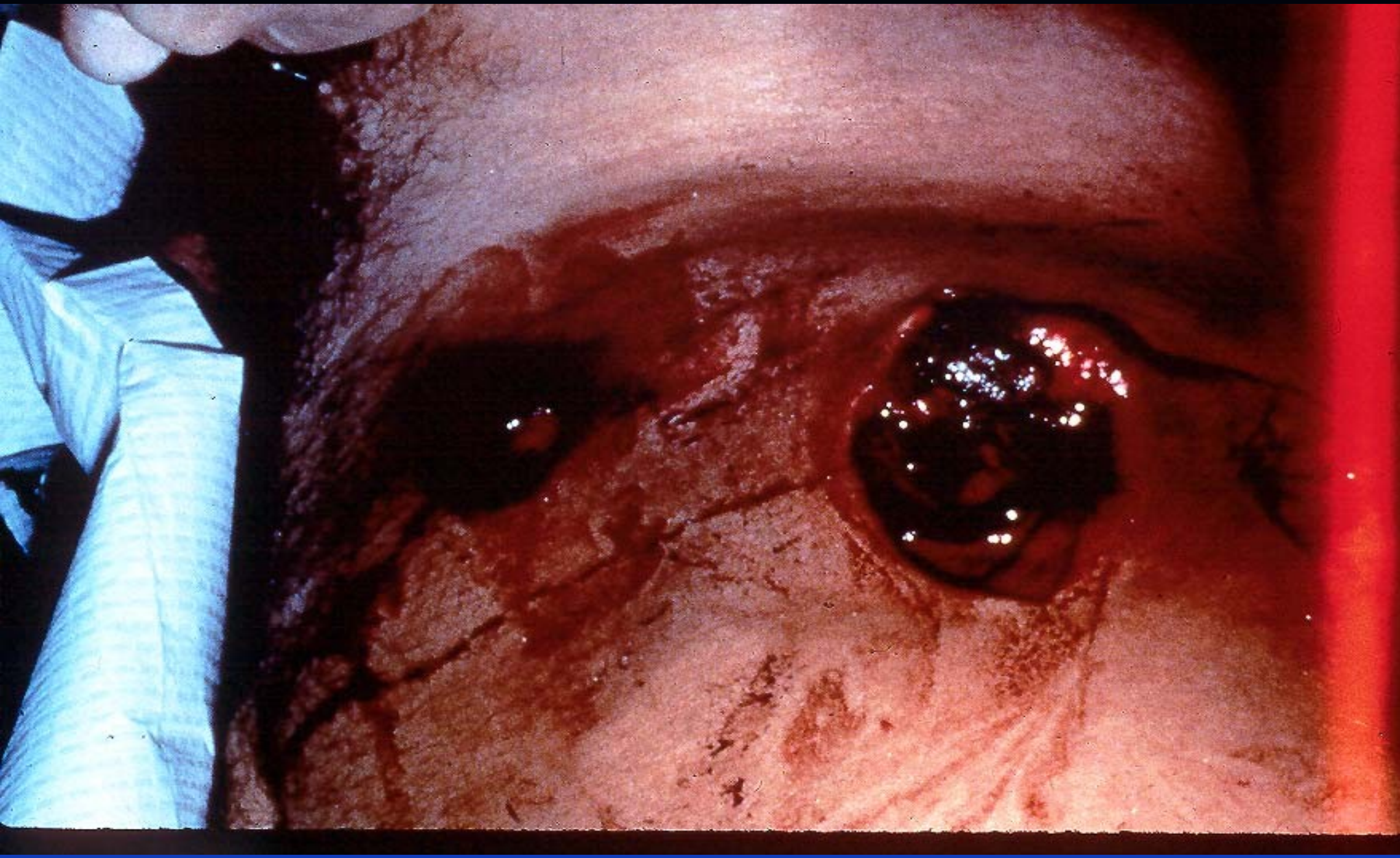
- Preventive medicine
- infectious disease
- combat casualty care - trauma
- NBC

Operational Scenarios

- Search and rescue
- NEO
- Humanitarian
- Raids
- Assaults

Military trauma care

- Different than civilian



- Different than civilian -
- or is it?

Main resource

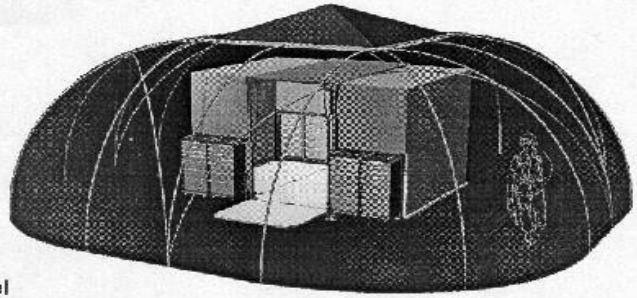
- People
- Good People

Changing doctrine

- Operational maneuvers from the sea
  - will result in different type of customer

Multipurpose Health Services Facility

The primary mission of the MPHSF (Multipurpose Health Services Facility) is to provide trauma management, resuscitative surgery, and temporary patient holding. The MPHSF quickly expands from a transit package of 5`x5`x10` to a 30`x30` sheltered space. The secondary mission provides space for ancillary services such as: sick call, x-ray, pharmacy, lab and preventive medicine.

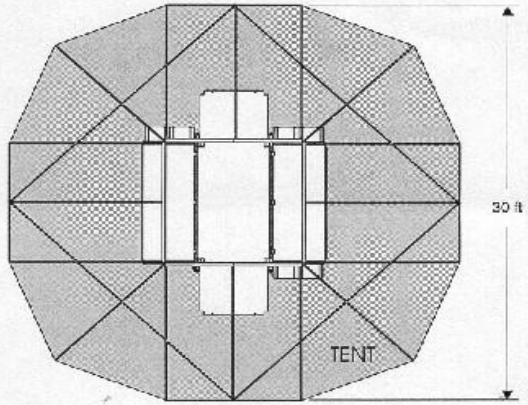


Operational Capabilities

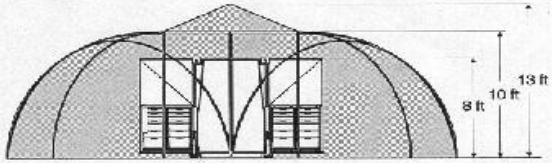
- At-sea configurable
- Compact transit pkg (3,600 lbs)
- Connectable, modular units
- Rapidly deployable
- Self contained

Combat Requirements

- Air deliverable via parachute
- Highly mobile in rough terrain
- Task organized (T/O) for 10 personnel
- Effective patient flow pattern for:
  - ☑ Triage
  - ☑ Surgery
  - ☑ Post-op
  - ☑ Patient holding
- Enclosed, positive pressure environment
  - ☑ NBC situations
  - ☑ Summer & winter climate ranges
- Resupply does not interrupt operations



TOP VIEW



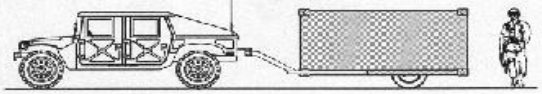
FRONT VIEW

Transportation and Basing

- Inter-theater deployable by:
  - ☑ C-130
  - ☑ MV-22 Osprey
  - ☑ Maritime Prepositioned Force (MPF)
  - ☑ Commercial ships
  - ☑ U.S. Navy Amphibious Assualt ships
- Intra-theater transportable by:
  - ☑ Medium and heavy lift helicopters
  - ☑ MV-22 Osprey
  - ☑ HMMWV
  - ☑ 5 ton trucks
  - ☑ Navy LCAC landing craft
  - ☑ Commercial carriers

Standardization, Interoperability, Commonality

- Fueling
  - ☑ DoD Single Fuel Policy
  - ☑ Generators organic to the MAGTF
- Electrical Power
  - ☑ Compatible with DoD standards
  - ☑ 10KW for emergency surgery
  - ☑ 3-5KW for routine & OOTW support
- Joint Service
  - ☑ Adapts to Navy AMAL
  - ☑ Adapts to Army Set/Kits/Outfits
  - ☑ Adapts to Air Force MFST
  - ☑ Adapts to LSTAT



For more information, contact:
Lcdr. Ed Howze, MSC, USN 703-784-6284
Capt. Robert S. Carnes, MD, MC, USN 703-784-1087

Mission

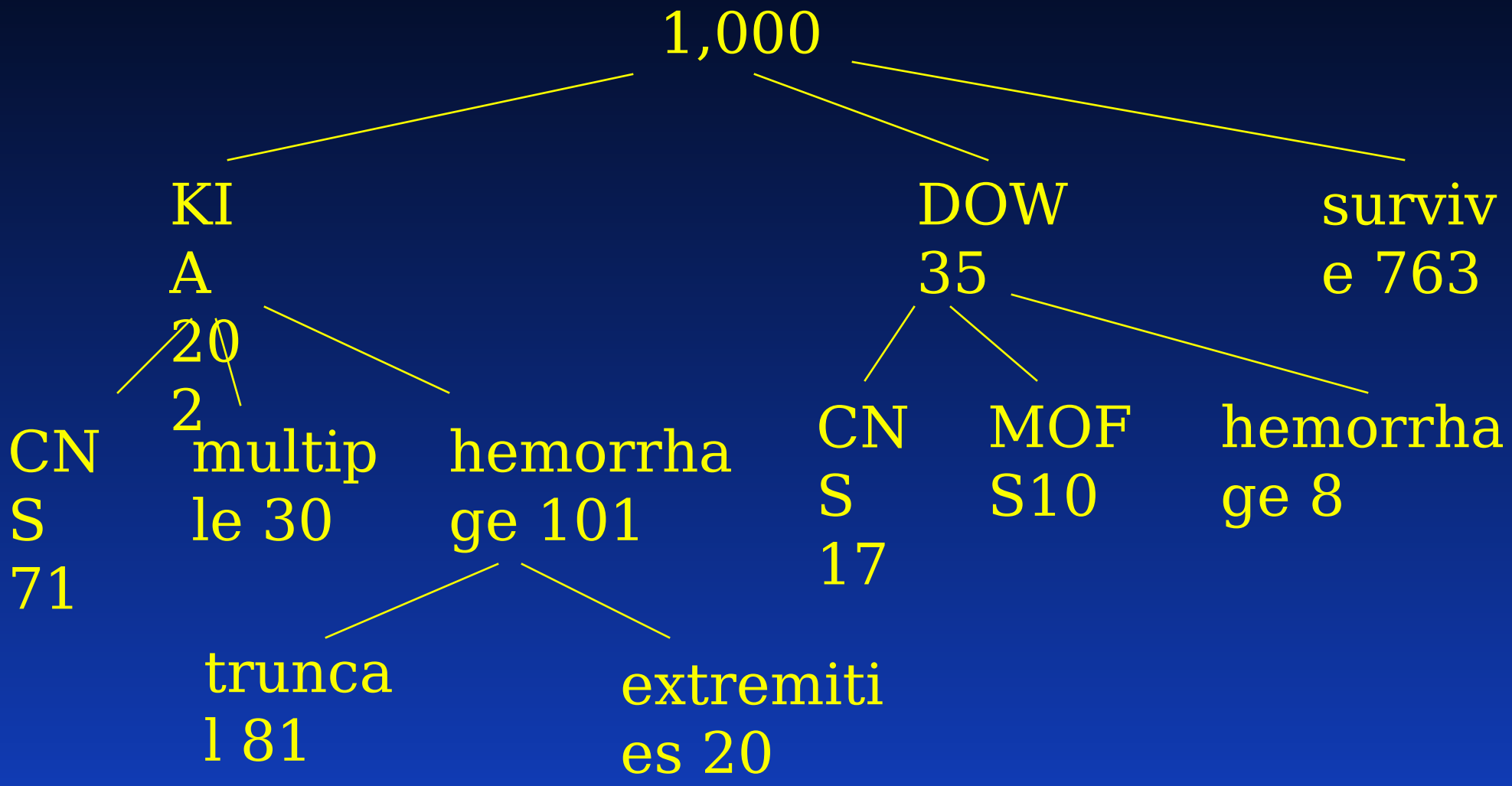
- Have to secure an Embassy
  - how many troops will be in harms way
- sources of customers
  - ship
  - air
  - land
  - refugees

Historical Trends

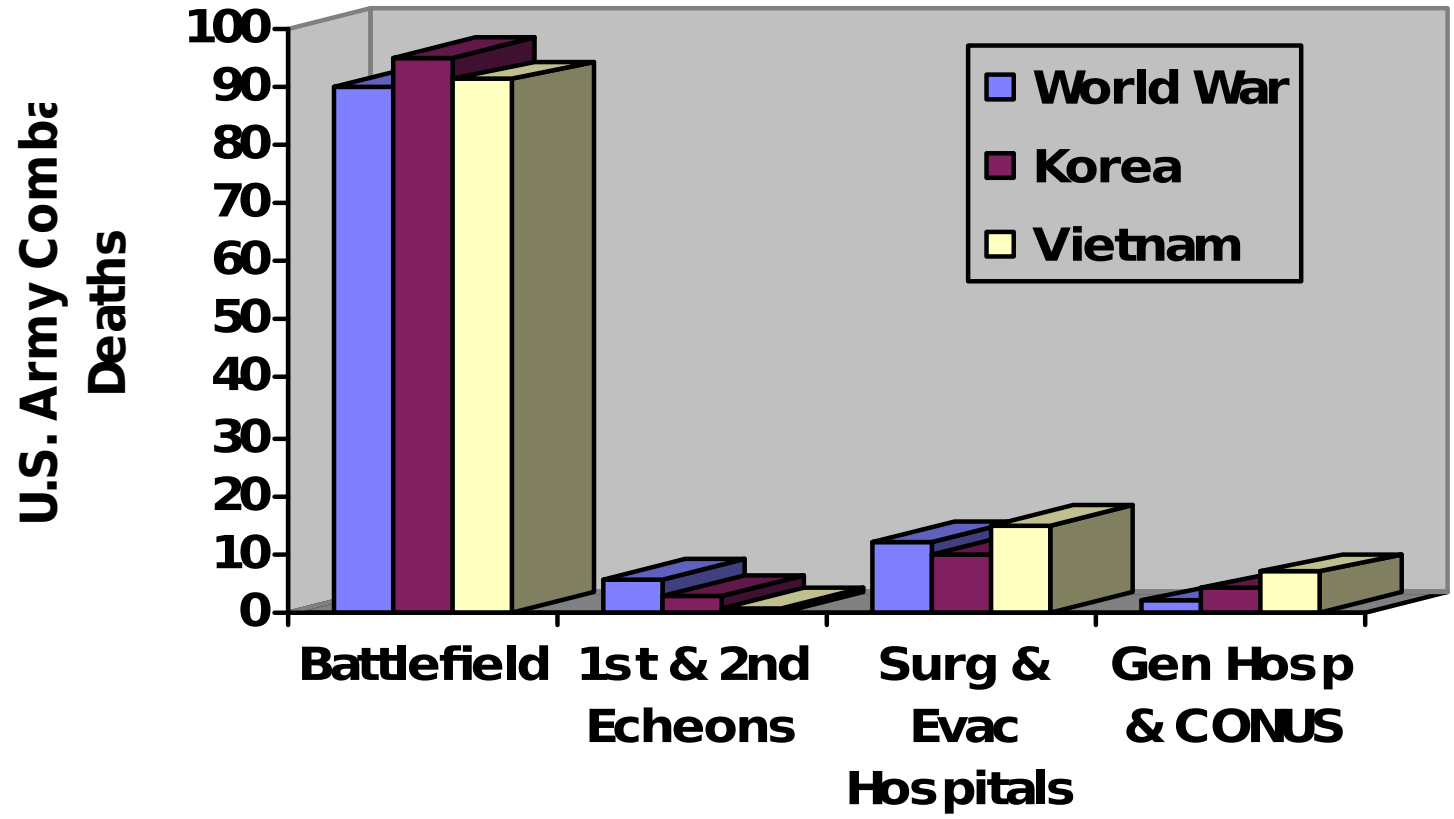
	KIA	DOW
Civil War	16.0%	13.0%
Russo-Japanese	20.%	9.0%
WW I	19.6%	8.1%
WW II	19.8%	3.0%
Korea	19.5%	2.4%
Vietnam	20.2%	3.5%

combat casualties

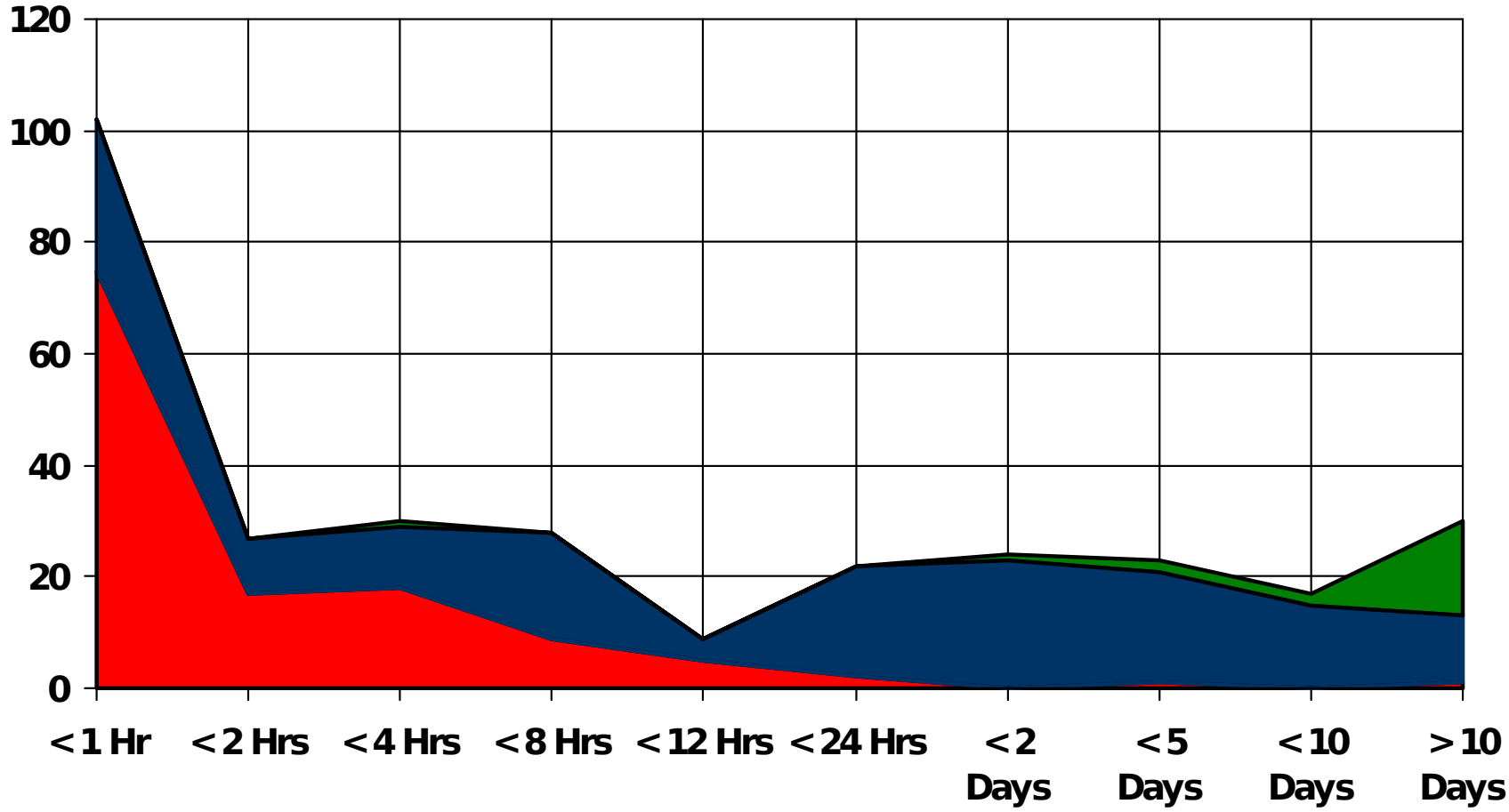
combat casualties



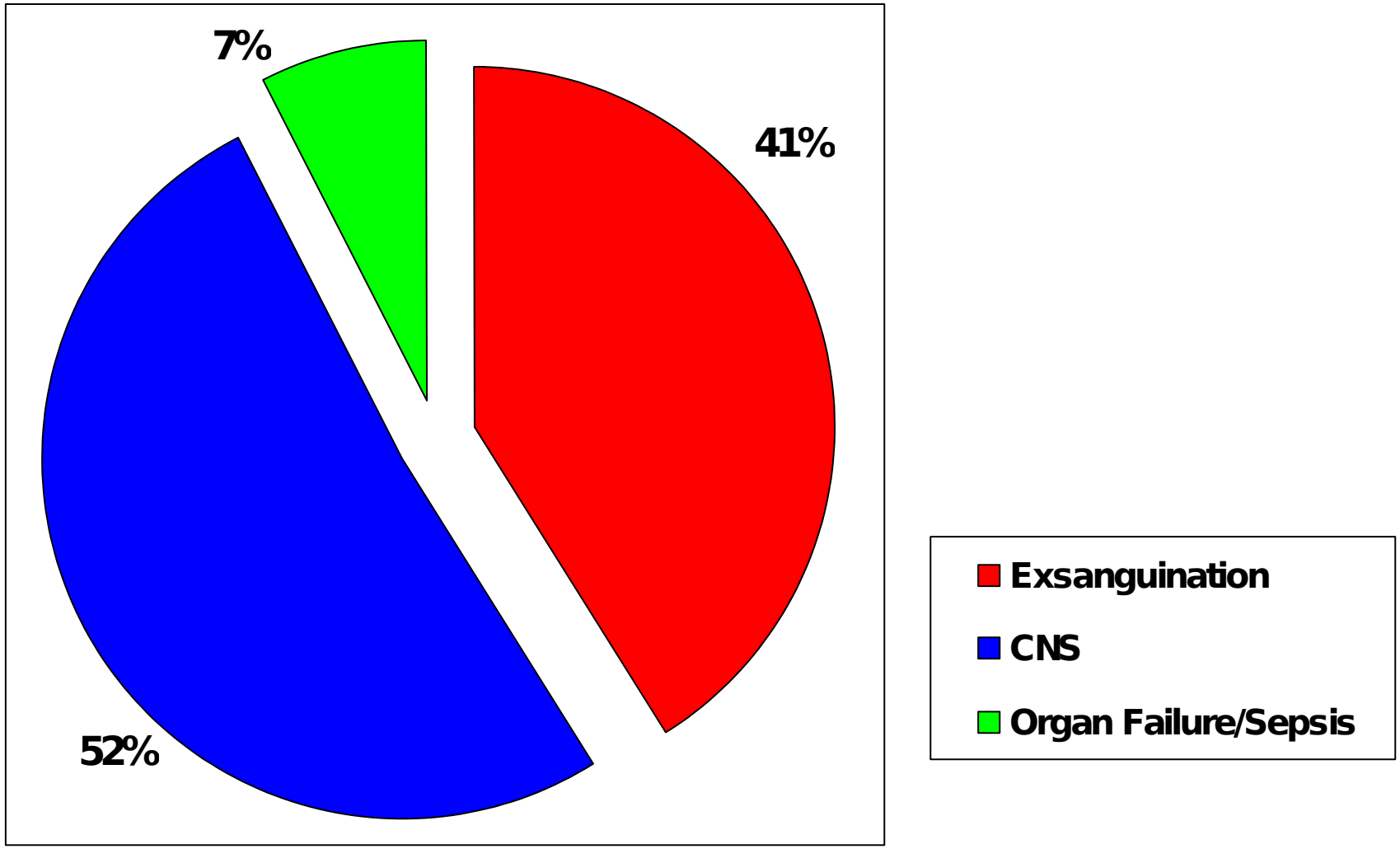
U.S. Army Combat Deaths

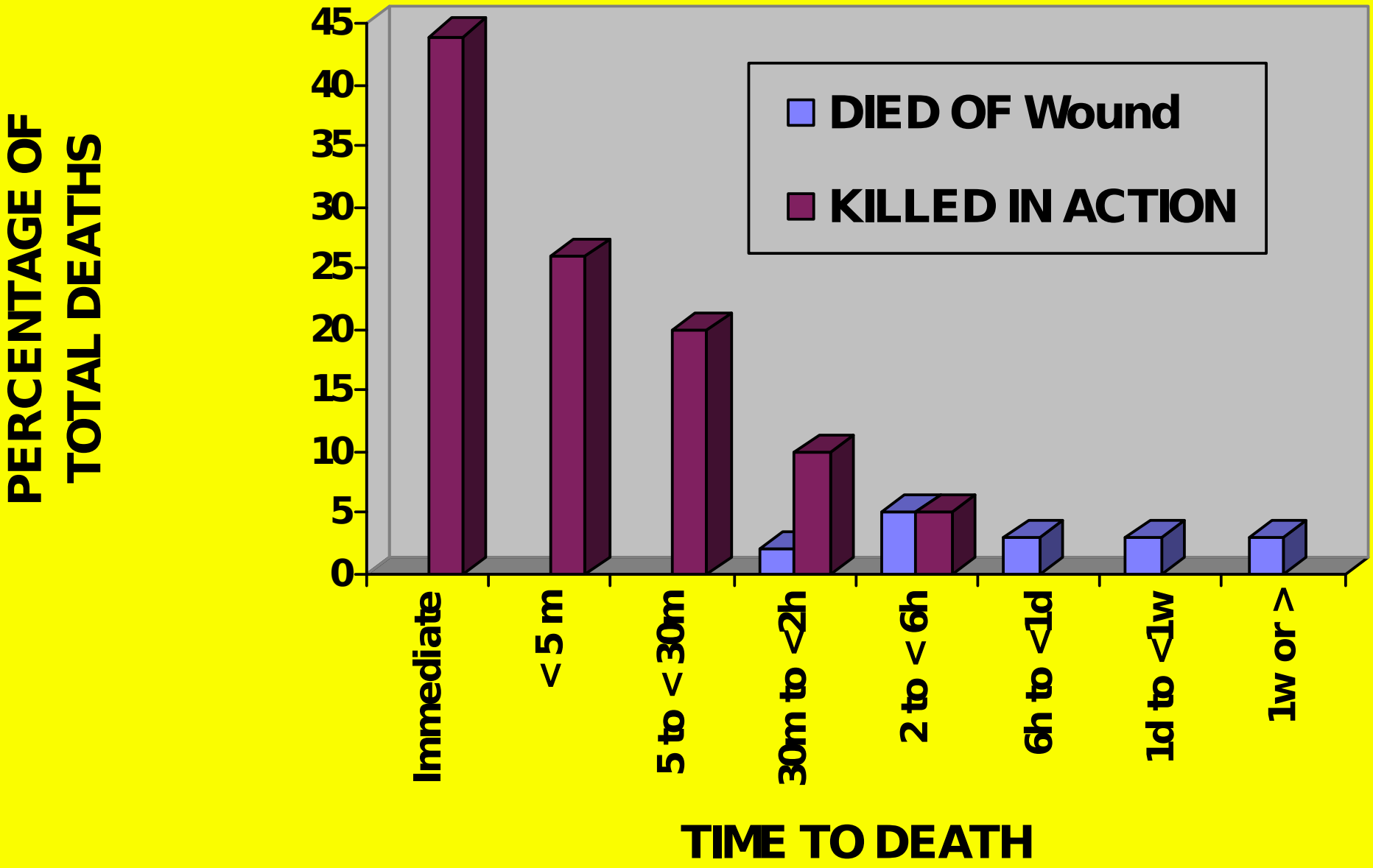


TRAUMA DEATHS 8924

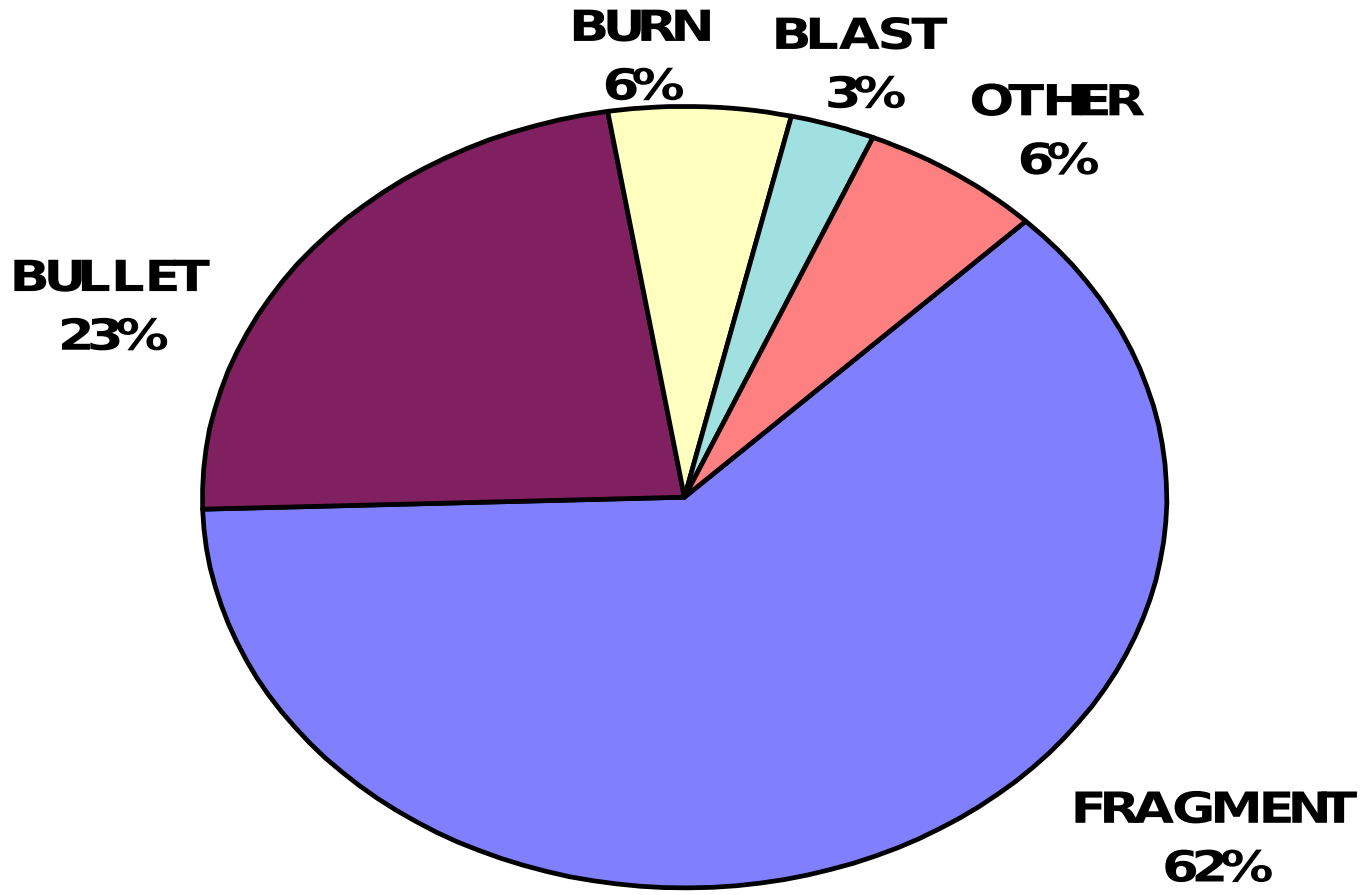


TRAUMA DEATHS 8294

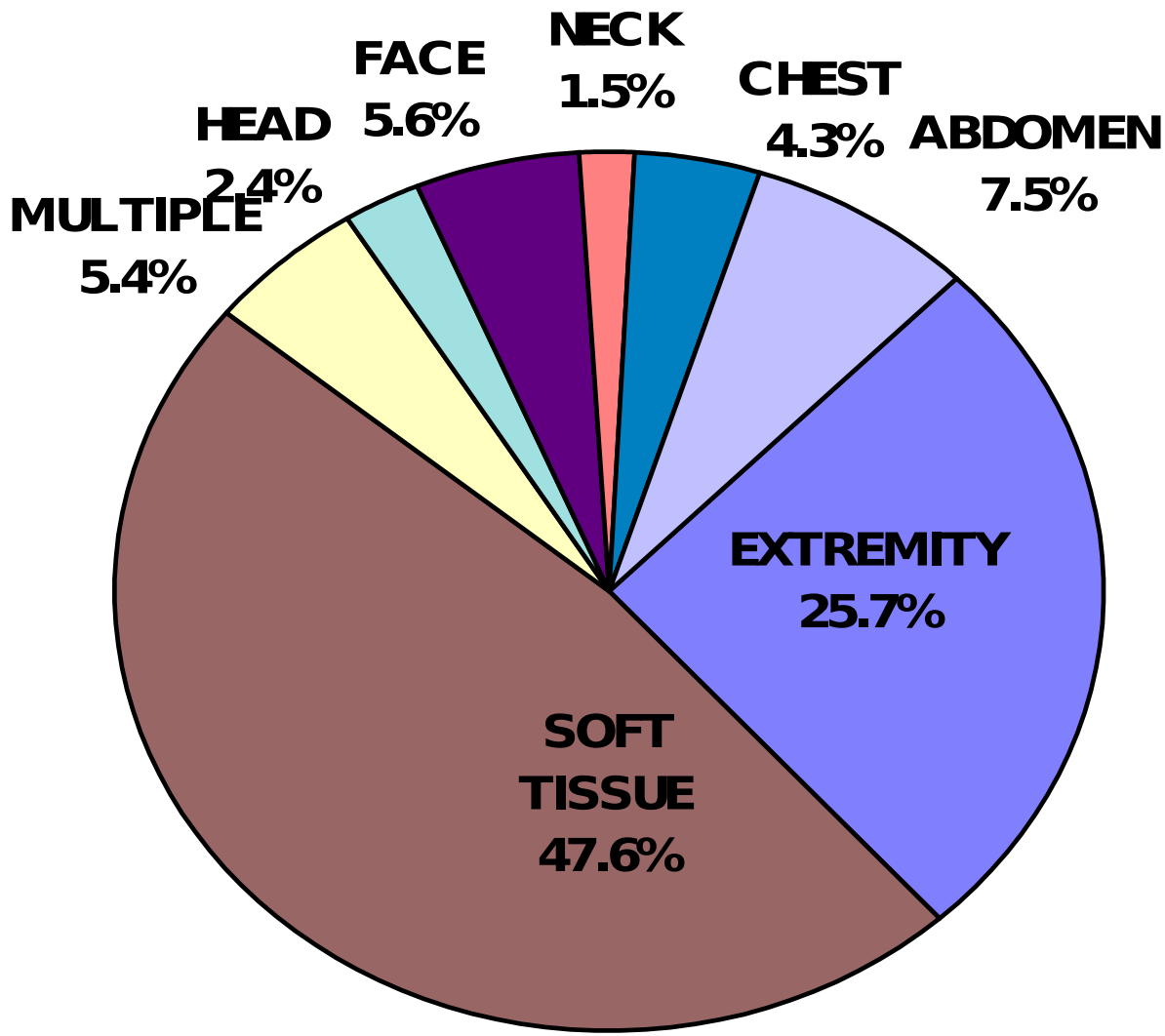



PERCENTAGE OF TOTAL DEATHS
45
40
35
30
25
20
15
10
5
0
DIED OF Wound
KILLED IN ACTION
Immediate
< 5 m
5 to < 30m
30m to <2h
2 to < 6h
6h to <1d
1d to <1w
1w or >
TIME TO DEATH

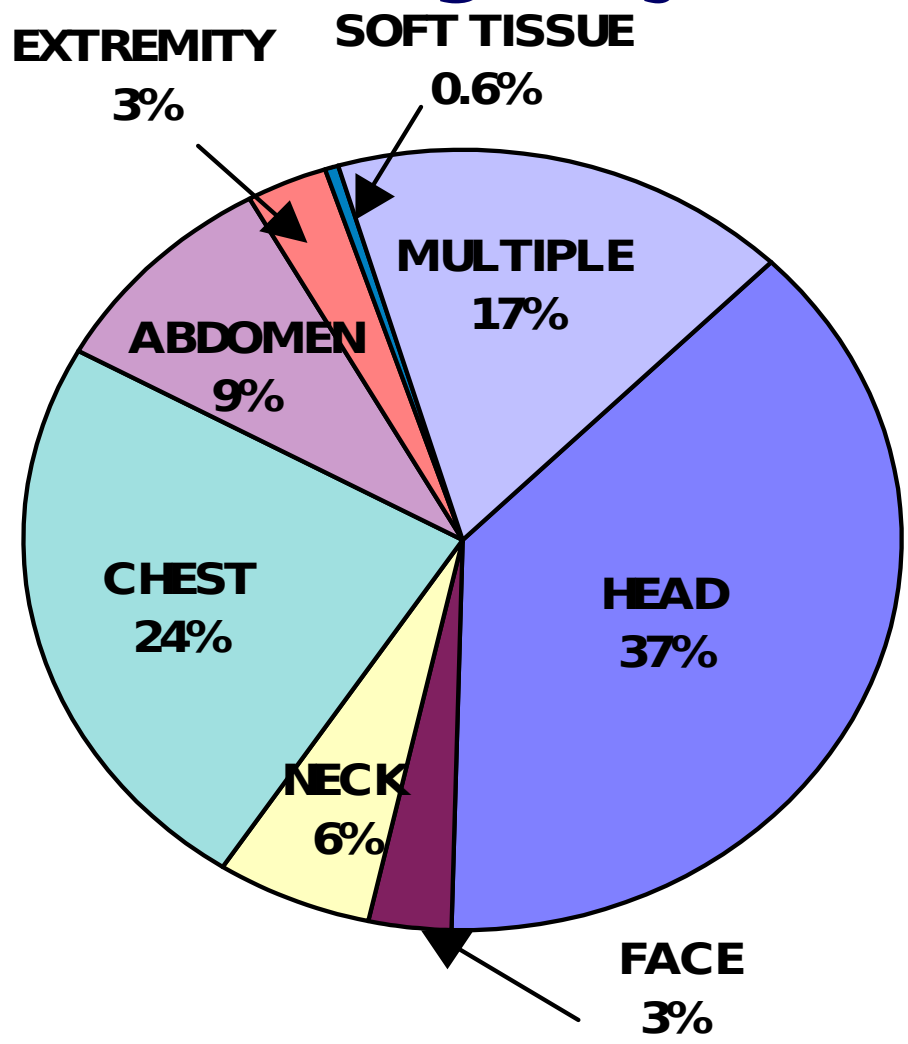
Mechanism of Wounding



Site of Primary Injury



Site of Fatal Primary Injury



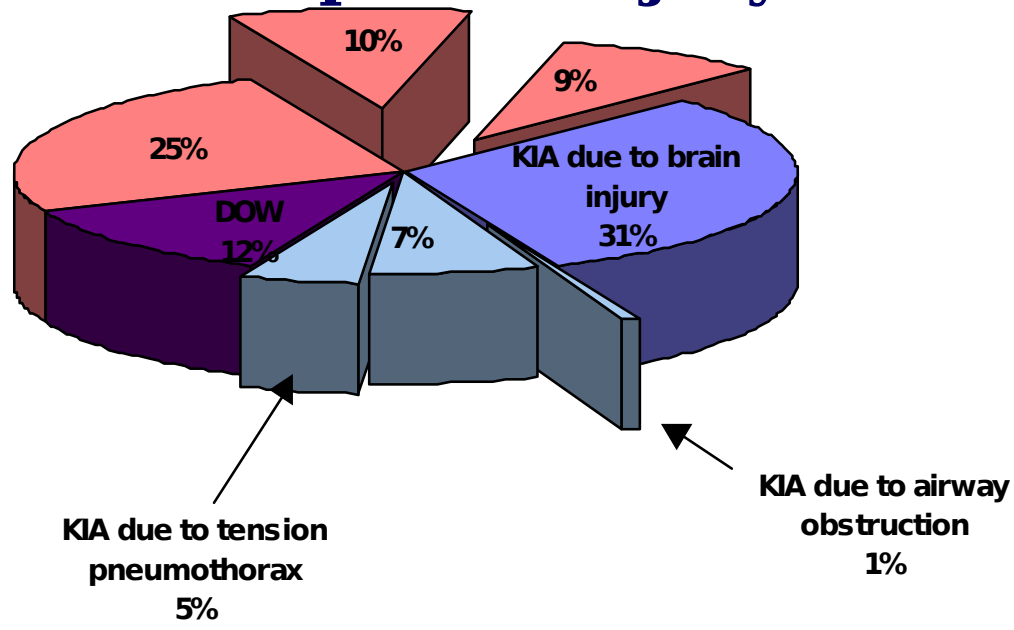
Potentially Salvageable Population

KIA Due to Exsanguination

25% Surgically uncorrectable torso injury

10% Surgically correctable torso injury

9% Peripheral injury



Somalia KIA

5 head injuries

4 helo crash

2 penetrating injury to the chest

upper back - heart or great vessels

RPG to the chest

1 groin - femoral artery and vein

2 multiple injuries - gsw to abd, gsw

First wave,

October 3, 1993

before the battle, 4 injured from land mine,

two operations lasted "into the early afternoon…"

Second wave

October 3,4, 1993

Mabry et al, J Trauma, 49:515;2000

Table 1. Surgical Procedures[a] Performed on October 3–5, 1993, at the 46th Combat Support Hospital, Mogadishu, Somalia

Surgical Procedure	Procedures Performed (n)
Fracture washouts	13
External fixation	1
Incision and debridement of open wounds	13
Flexor tendon repair	1
Fasciotomy	2
Exploratory celiotomy	6 (2 nontherapeutic)
Bowel repair	1
Splenorrhaphy	1
Gastric repair	1
Liver and portal vein repair	1
Aortic cross-clamp	1
Sternotomy and celiotomy	1
Total hepatic exclusion	1
Vena cava repair	1
Tube thoracotomy	1
Neck explorations	2 (1 nontherapeutic)
Carotid artery repair	1
Tracheostomy	1
Scalp laceration closure	1
Burn debridement	1
Completion of hip disarticulation	1
Above-the-knee amputation	1
Closed reduction of fracture	1
Examination under anesthesia	1
Total	56

[a] Surgical patients (31), operative cases (34), and postoperative deaths (3) in Somalia.

DOW

- 3 died of hemorrhage and were in “extremis”
  - bullet to right flank, liver, portal vein, spleen, cross clamped and made expectant.
  - 2 underwent “damage control surgery” died in ICU
- 1 died later after evacuation to Germany
  - right hemothorax, inferior vena cava, 5 hour delay in transport.

Table 2. Total United States Casualties, Battle of the Black Sea

Casualty Category	Casualties (n)	Percent
Killed in action (KIA)	14	11.2
Wounded who died	4	3.2
Wounded in action (WIA)	58	46.4
Carded for record only (CRO)	49	39.2
Total	125	100
KIA rate = KIA/(KIA + DOW + WIA)		18.4
DOW rate = DOW/(DOW + WIA)		6.4

KIA and DOW rates do not include the CRO category.

Mabry et al, J Trauma, 49:515;2000

Avg LOS - 22 days

Table 4. Distribution of Injuries for Wounded in Action

Anatomic Area	Gunshot	Fragments	Blunt	Burn	Total (by Anatomic Area)	Percent
Head/face	1	5	3	0	9	9.9
penetrating[a]	0	1			1	1.1
Neck	0	1	0	0	1	1.1
penetrating[a]	1	1			2	2.2
Thorax/back	2	0	4	0	6	6.6
penetrating[a]	0	0			0	0
Abdomen	1	0	1	0	2	2.2
penetrating[a]	0	1			1	1.1
Genitalia	1	0	0	0	1	1.1
Extremities	32	30	4	2	68	74.7
Total	38	39	12	2	91	
Percentage	41.7	42.9	13.2	2.2		100

[a] Injuries of the head, neck, chest, and abdomen are classified as penetrating if they violated the skull, platysma, chest cavity, or peritoneum.

Table 8. Injuries Carded for Record Only

Injury	Number
Fragment wounds	23
Ruptured eardrums	3
Contusions	2
Minor burn	2
Grazing gunshot wound	1
Corneal abrasion	1
Broken teeth	1
Sprain	1
Abrasion	1
Total	35

- seen 1-2 days after the battle

-not seen at the hospital but by medics, PA, MO.

Combat Support Hospital Case Log

Six Months of a UN Mission--46th CSH

- 266 trauma cases
- 35 non-trauma cases
- Two general surgeons
- One orthopedic surgeon
- One anesthesiologist
- Three OR tables / 60 beds

Case Distribution

- Orthopedic 163 cases (61%)
  - 80 Open fractures (49%)
  - 53 washouts (32%)
  - 42 Hand (26%)
  - 6 ORIF (4%)
  - 3 amputations (2%)
  - 2 fasciotomies (1%)
  - 4 open pelvic fractures / GSW (2%)
  - 3 Spine fractures (2%)

Case Distribution

- General Surgery 103 cases (39%)
  - 31 Abdominal exploration (30%)
  - 14 Vascular repair (14%)
  - 11 Thoracotomy (11%)
  - 10 Facial GSW (10%)
  - 9 Neck exploration (9%)
  - 9 Tracheostomy (9%)
  - 6 Burns (6%)

Case Distribution

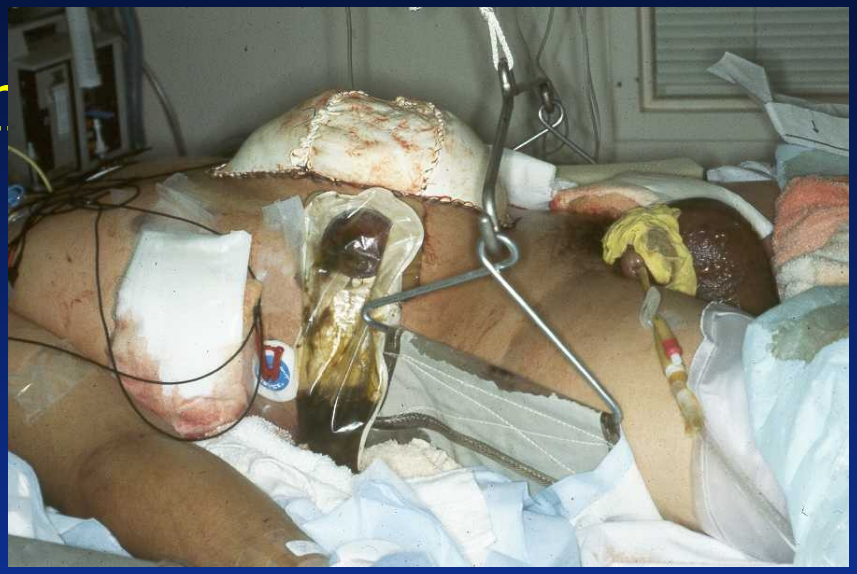
- General Surgery (con.)
  - 4 Craniotomy (4%)
  - 3 Ocular injury/enucleation (3%)
  - 3 Head lacerations (3%)
  - 1 testicle exp (1%)
  - 1 nephrectomy (1%)
  - 1 urinary bladder repair (1%)

Changing doctrine

- Operational maneuvers from the sea
  - will result in different type of customer

Operative cases

- Orthopedic
- wound debridemer
- vascular
- abdominal
- thoracic



Historical Trends

	KIA	DOW
Civil War	16.0%	13.0%
Russo-Japanese	20.%	9.0%
WW I	19.6%	8.1%
WW II	19.8%	3.0%
Korea	19.5%	2.4%
Vietnam	20.2%	3.5%

exsanguination

- Main source of death in combat

Civilian Mortality Rates for Patients with Low Vital Signs

	SBO < 90	SBP = Immeasurable
Prevalence Rate	6%	3.0%
Mortality Rate	56.0%	93.5%
Death within 30 minutes	30.0%	67.0%

1960’s fluids = good

- Dillon J, Lynch LJ, Myers R, et al: Bioassay of treatment of hemorrhagic shock. Arch Surg 93:537, 1963
- Shires GT, Coln D, Carrico J: Fluid therapy in hemorrhagic shock. Arch Surg 88:688,1964

1980’s more fluid = better

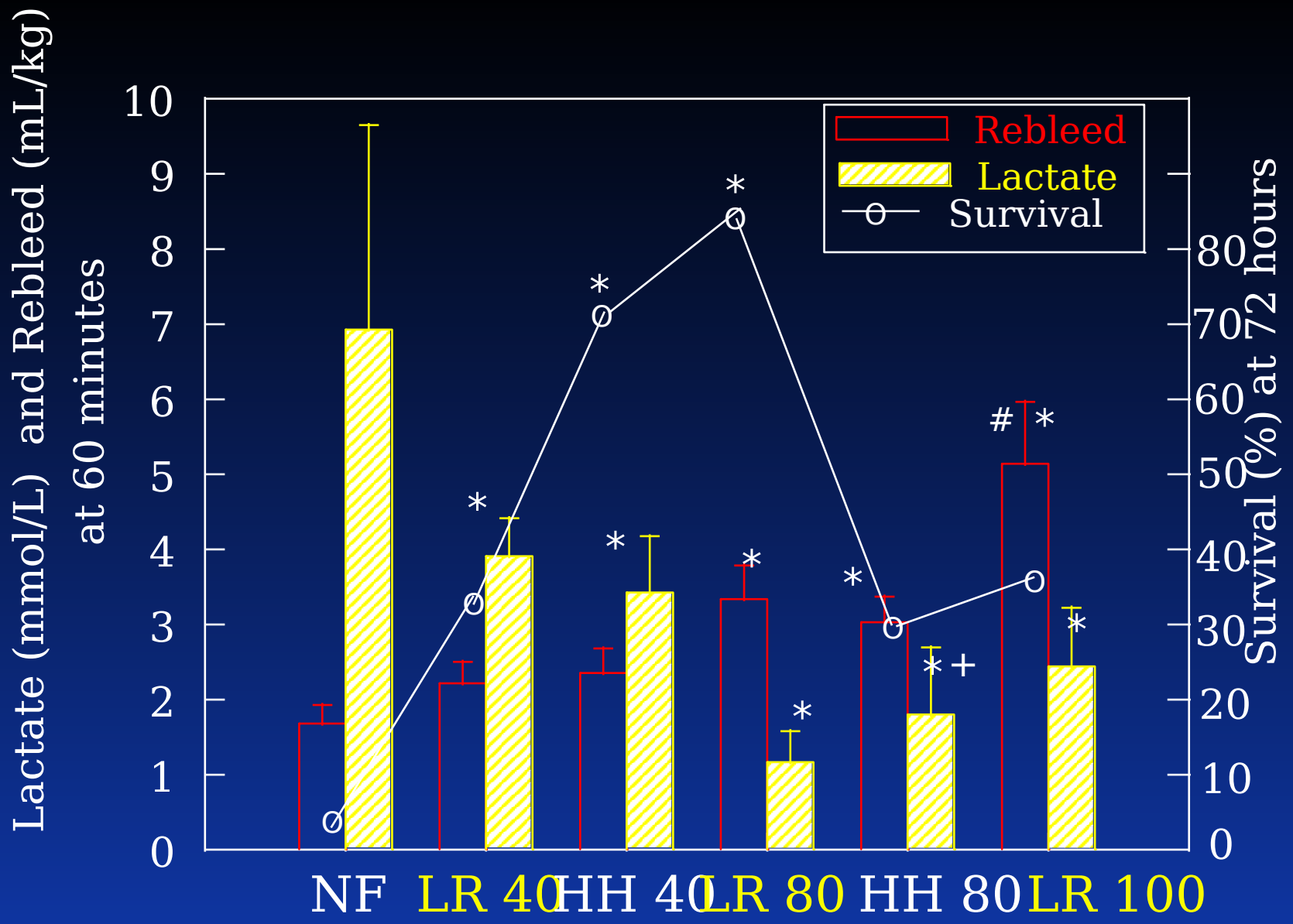
- Bishop, shoemaker et al: ‘in critically ill patients on going ischemia is bad”
- after hemorrhagic shock “ an oxygen debt “ needs to be treated.
- resuscitating pts before going to the OR
- ATLS - emphasized IV access.
- ATLS improves predicted mortality

1990’s fluid = not so good ?

- ATLS bad??
- scoop or run??
- what is more important? time or fluids

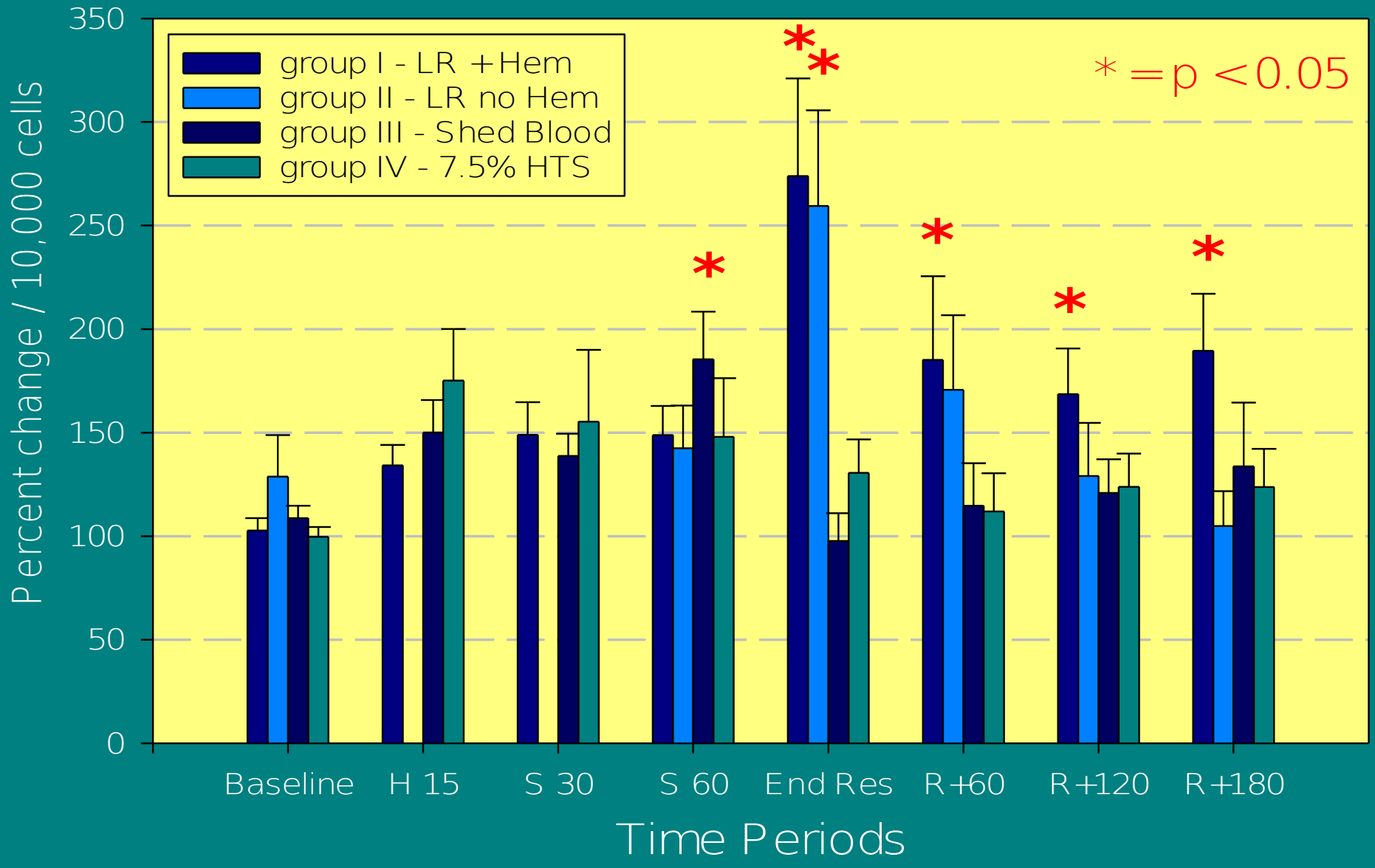
"to resuscitate or not to resuscitate"

- Cannon WB, Faser J, Collew EM: The preventive treatment of wound shock. *JAMA*, 47:618, 1918
  - "… inaccessible or uncontrolled sources of blood loss should not be treated with intravenous fluids until the time of surgical control."
- Shaftan GW, Chiu C, Dennis C, Burton B: Fundamentals of physiologic control of arterial hemorrhage. *Surg*, 58:851,1964
- Bickell, WH, Wall, MJ, Pepe, PE, et al: Immediate versus delayed fluid resuscitation for hypotensive patients with penetrating torso injuries. *NEJM*. 1994;331;1105-1109.
  - "a prospective randomized trial … "

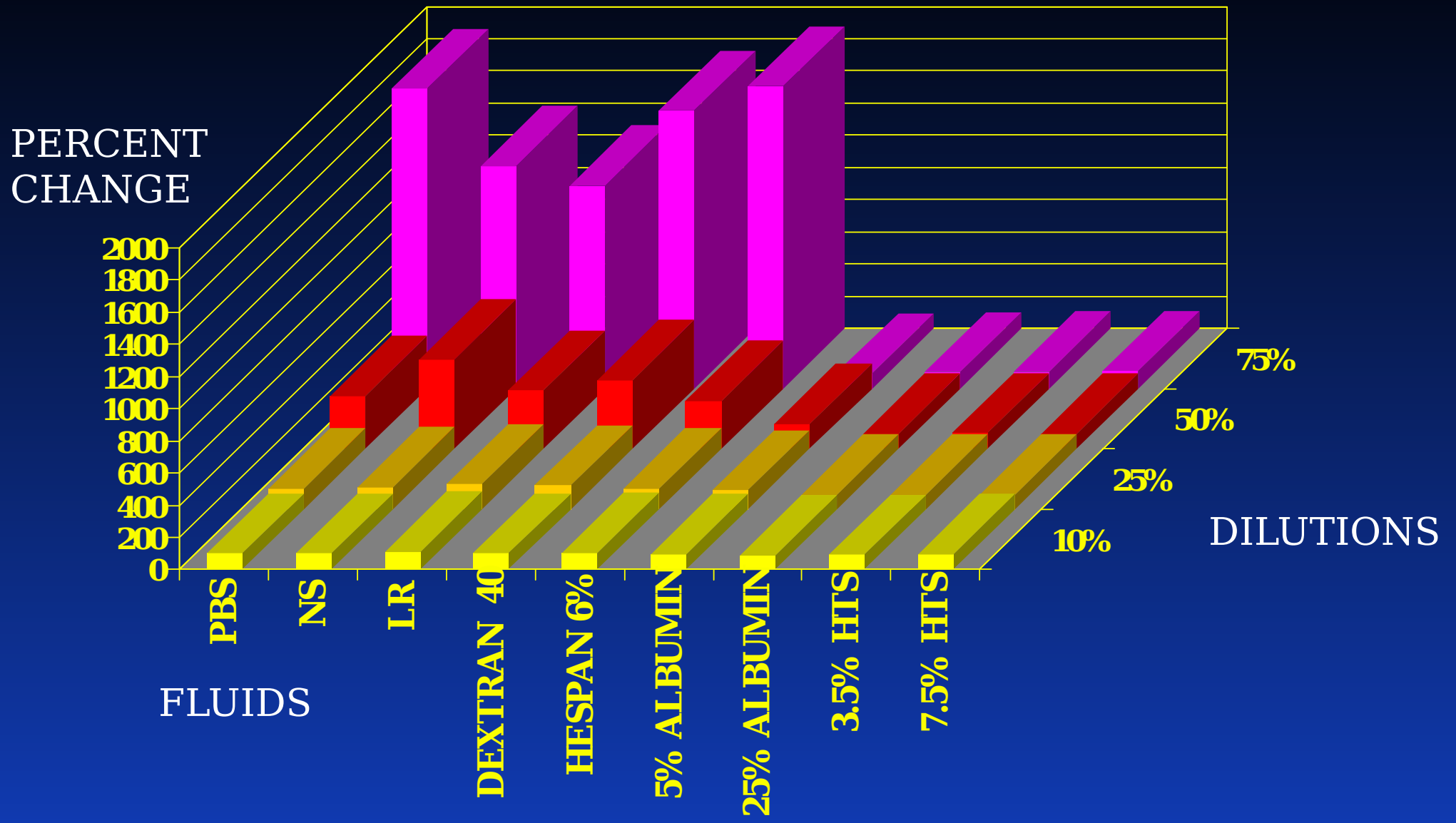


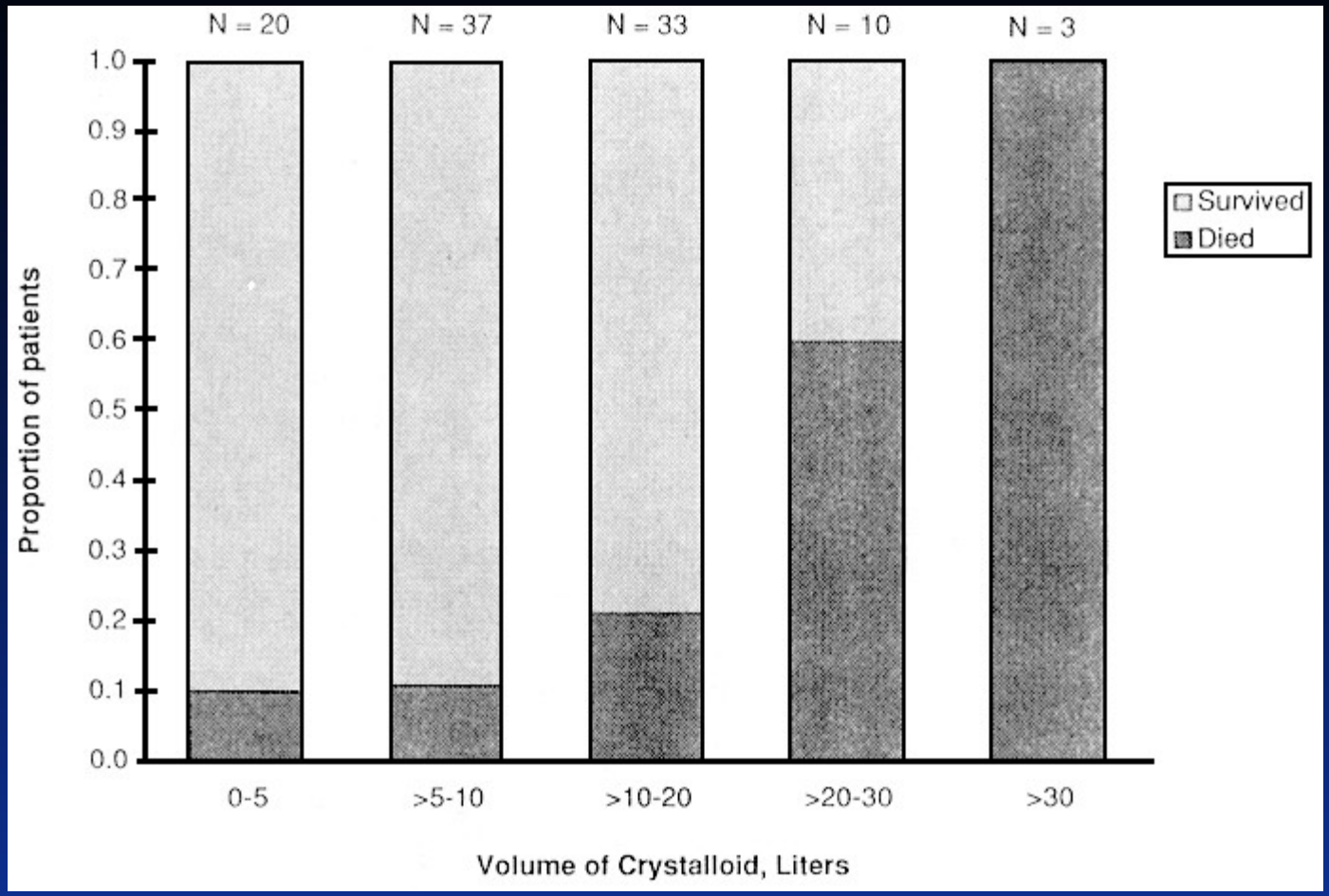
* Compared to NF, # to all others, + to baseline ($p < 0.05$

Neutrophil Activation

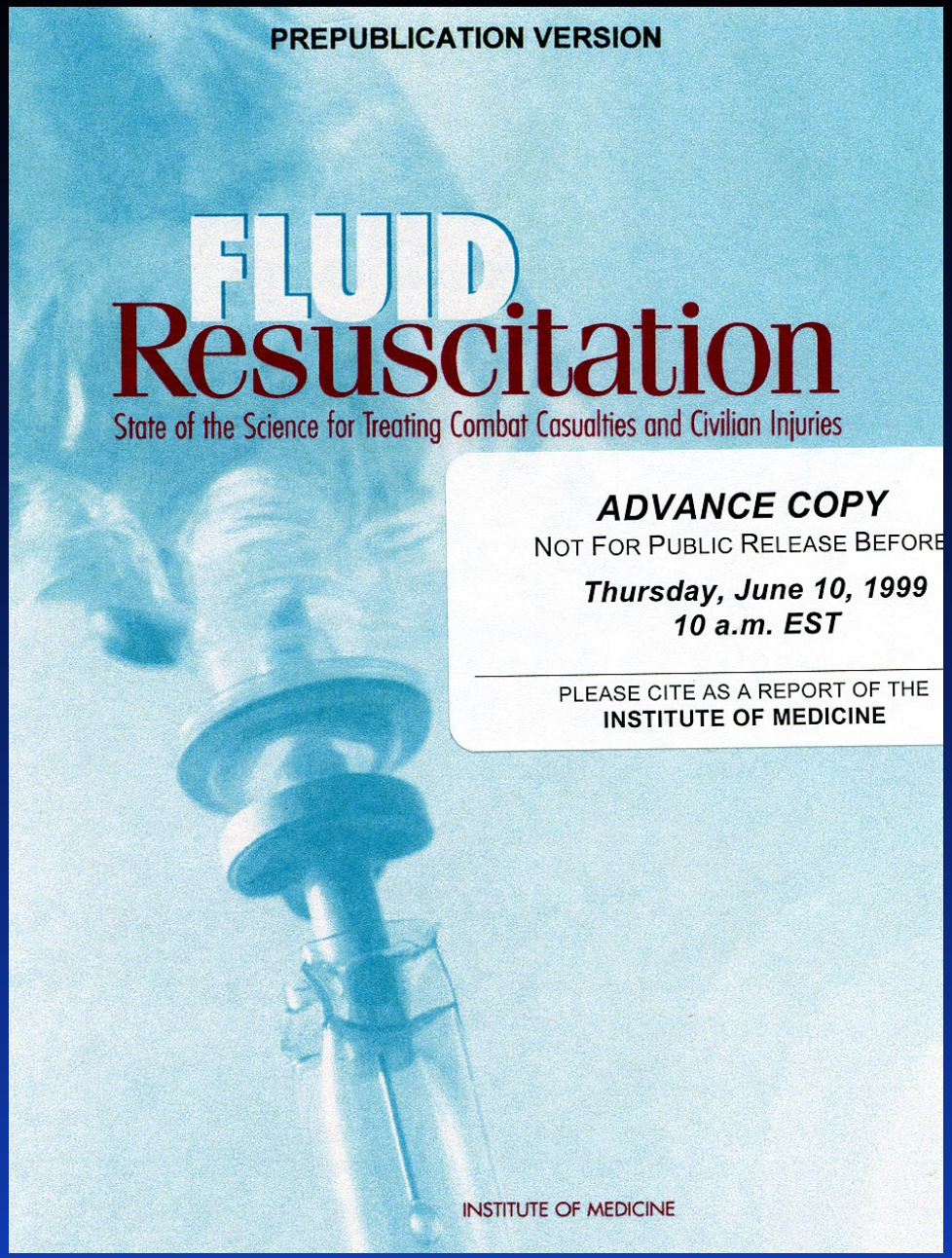


NEUTROPHIL FLUORESCENCE (ACTIVATION





Heckbert SR, Vedder NB, Hoffman W, et al: Outcome after hemorrhagic shock in trauma patients. *J Trauma* 45:545, 1998



Committee members

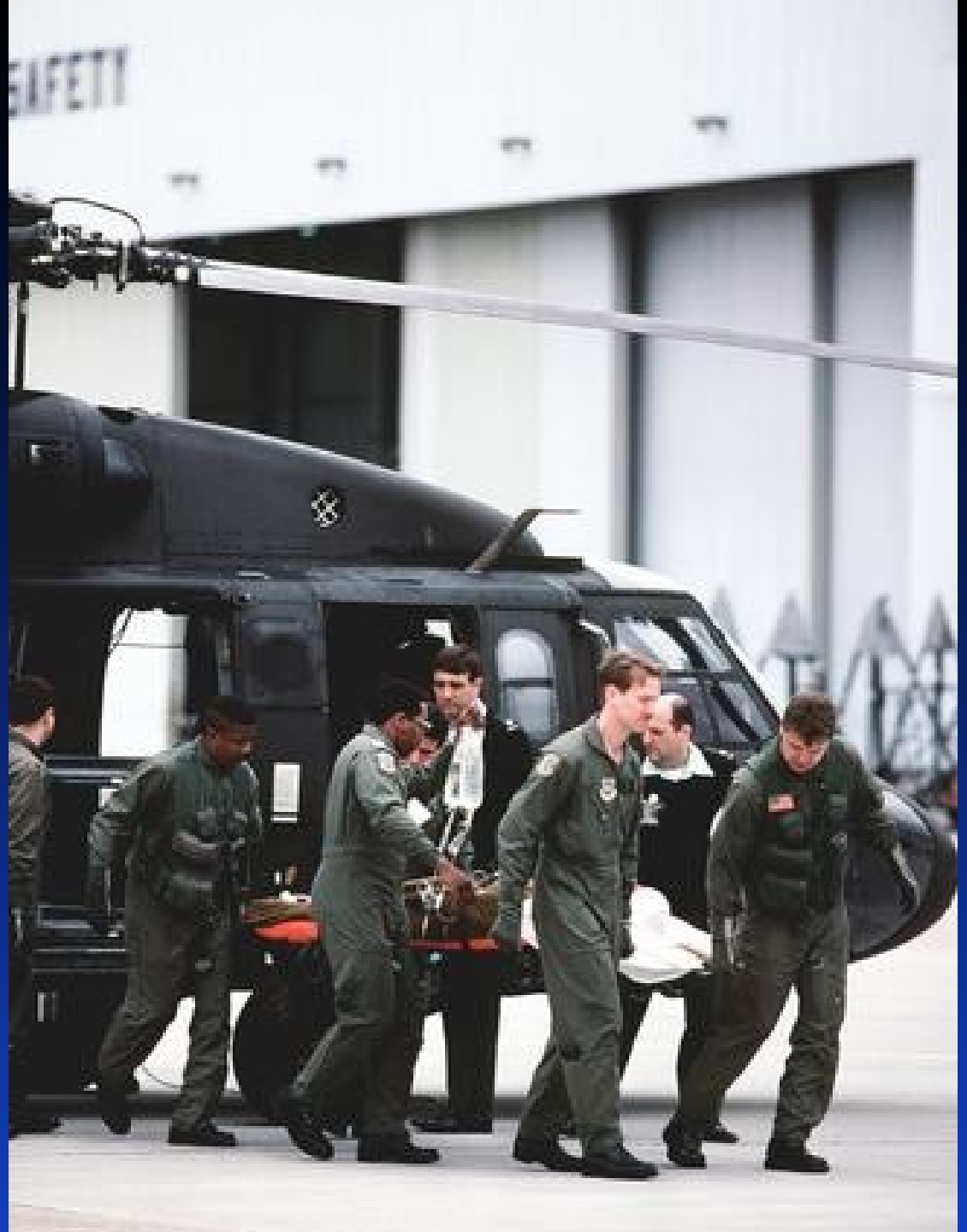
- David Longnecker (Chair)
  - Univ Penn Health System
- William G Baxt
  - Univ Penn Health System
- Joseph C Fratantoni
  - Biologics, C.L. McIntosh & Associates
- Jureta W. Horton
  - U Tex SWMS
- John P. Kampine
  - MC Wisconsin
- Harvey G. Klein
  - NIH
- Joseph E. Rall
  - NIH
- George F Sheldon
  - UNC
- Blane C. White
  - Wayne State USM

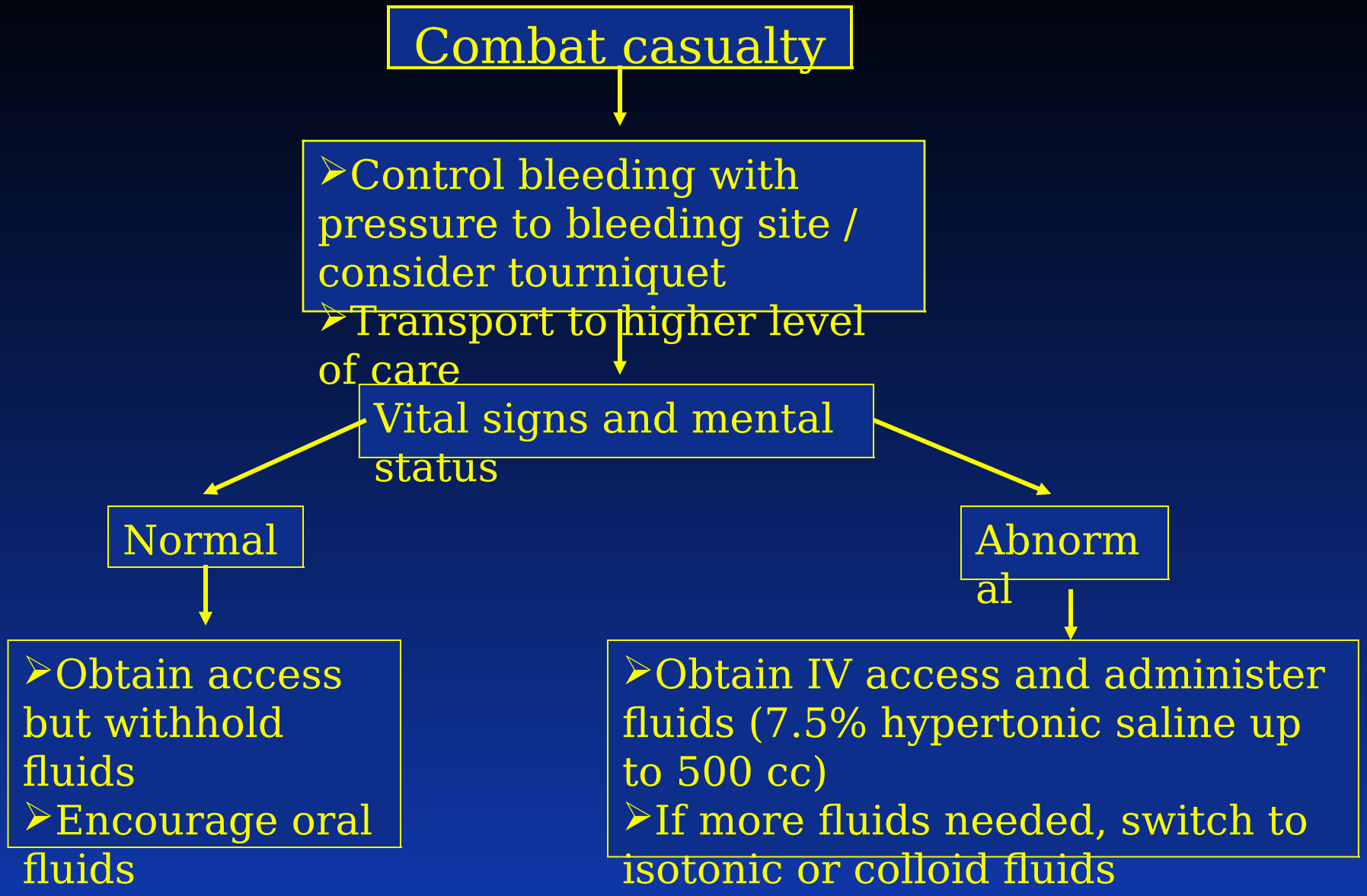
Recommendations

- Initial fluid - 250cc bolus of 7.5% hypertonic saline vial rapid-infusion system
- Research to modify LR
  - eliminate -D-lactate, reduce total -L-lactate
  - add ketones, add free radical scavengers and antioxidants

“Black Hawk Down”

- “…they ran stooped, …they had to keep setting down the litter to return fire. They would run a few steps, set Blackburn down, shoot, then pick him up and carry him a few more steps, then put him down again.”



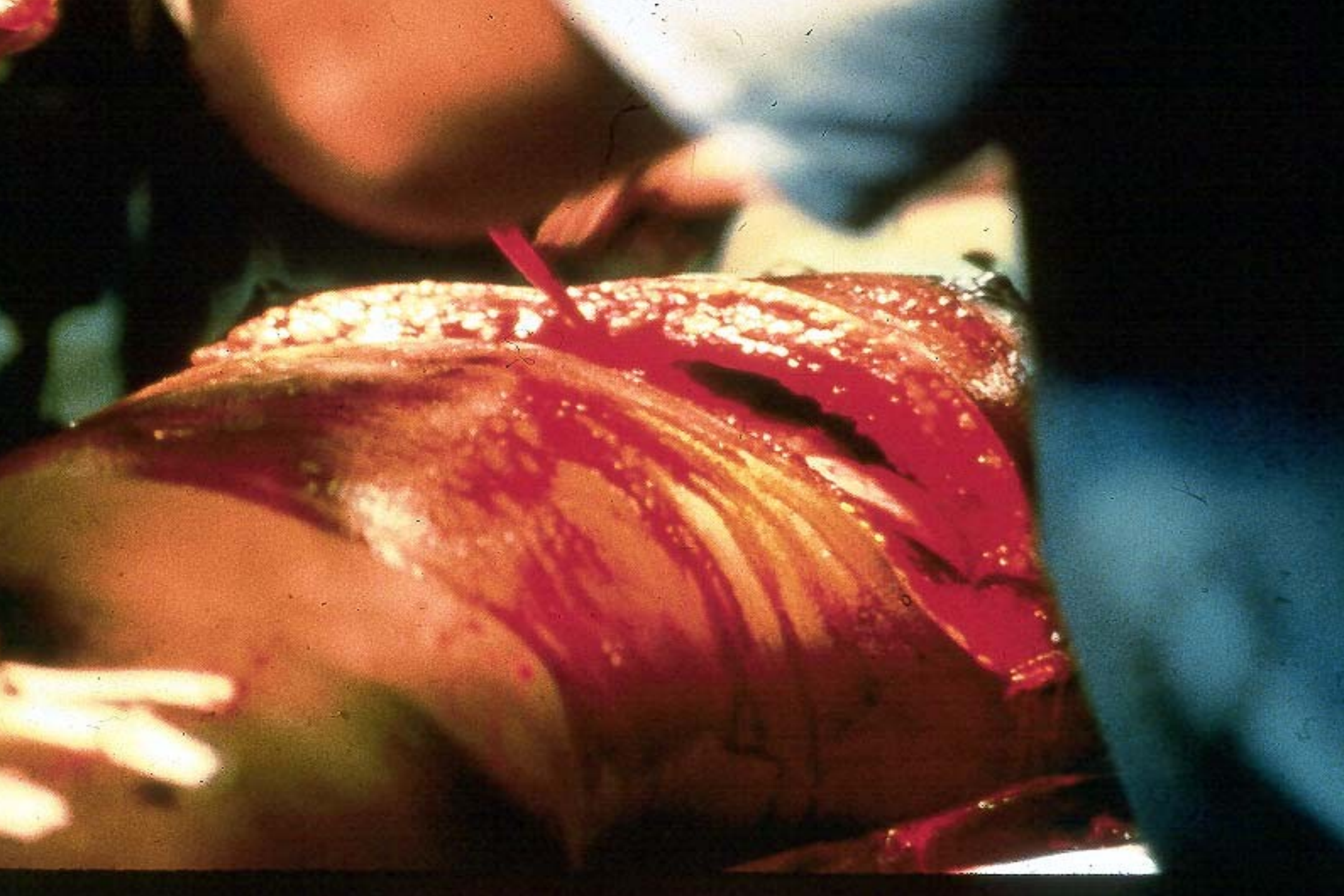

Combat casualty
➢Control bleeding with pressure to bleeding site / consider tourniquet
➢Transport to higher level of care
Vital signs and mental status
Normal
Abnormal
➢Obtain access but withhold fluids
➢Encourage oral fluids
➢Obtain IV access and administer fluids (7.5% hypertonic saline up to 500 cc)
➢If more fluids needed, switch to isotonic or colloid fluids

Saving lives

- Airway
- Breathing
- Circulation

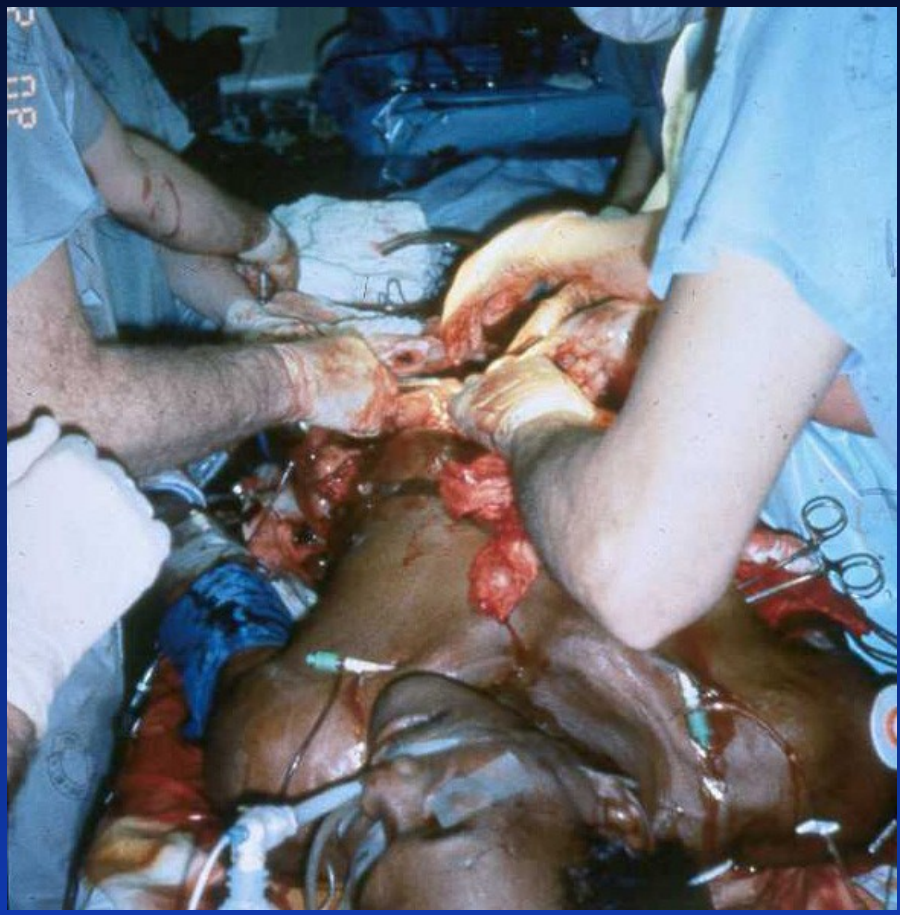
treatment

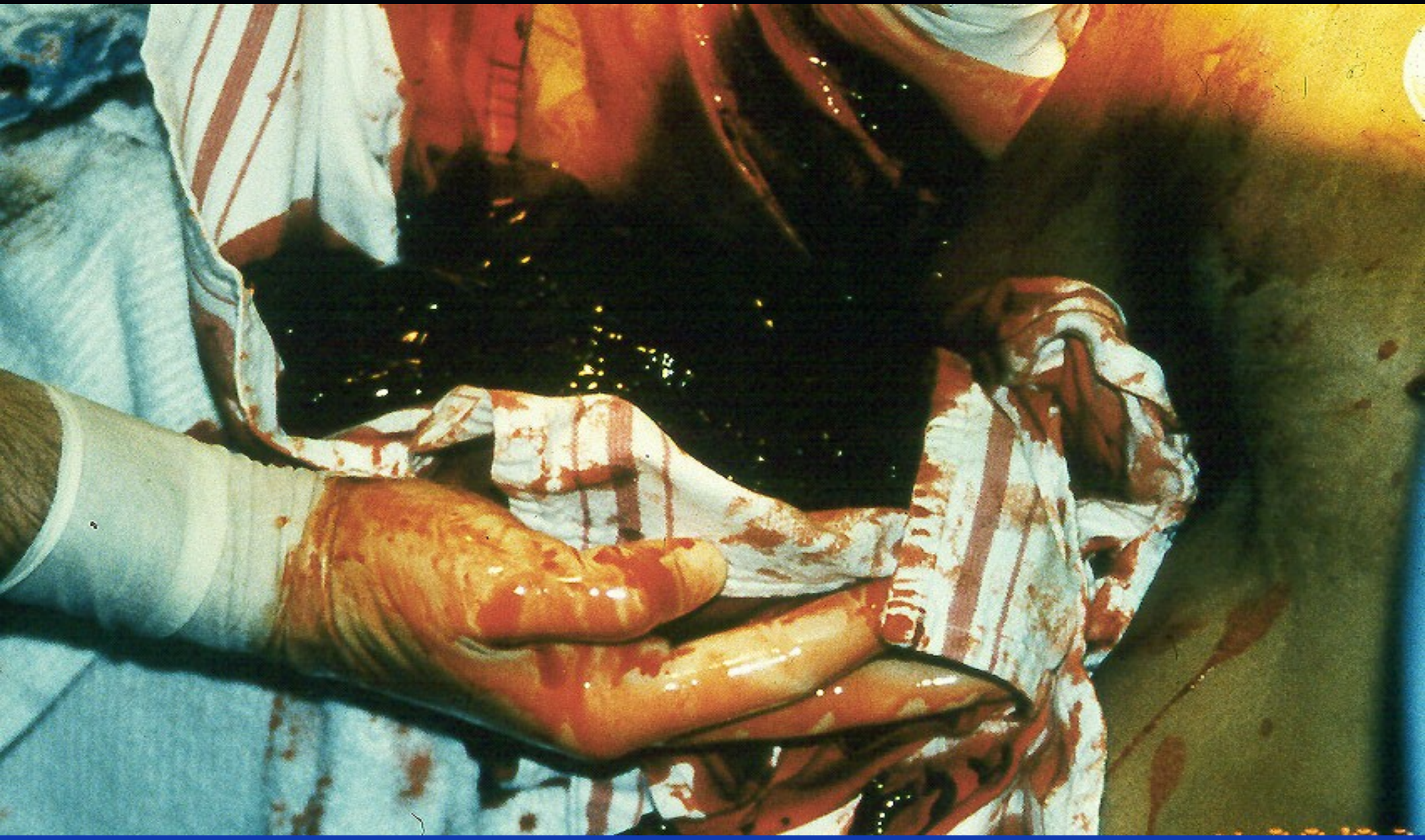
- Stop the bleeding!!
- Giving fluids first increases blood loss
- scoop and run

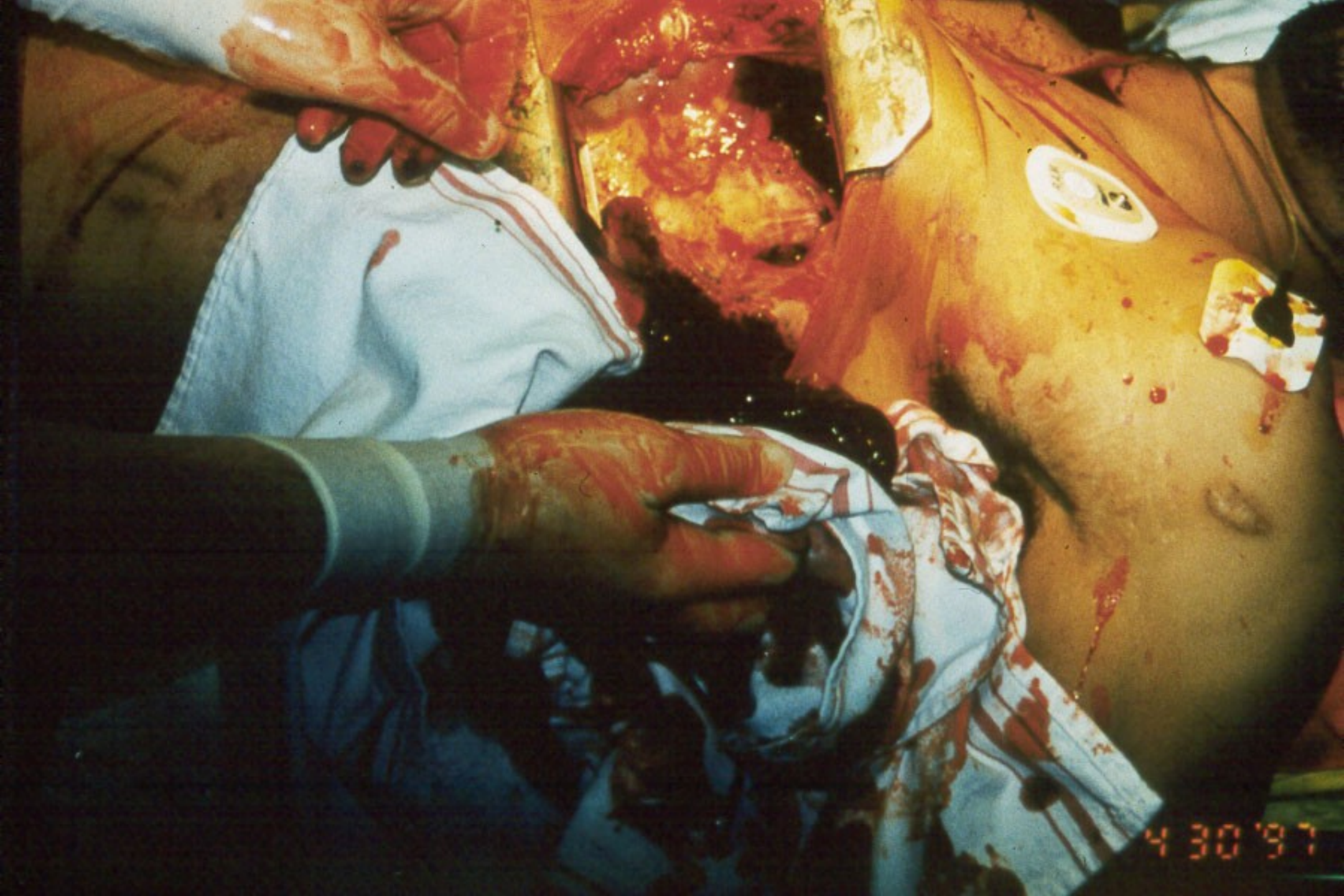


90 1 28

Trauma Overview






4 30 97